PANTROPICAL ALOS/PALSAR DATABASE IN SUPPORT OF FOREST CARBON TRACKING

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1. INTRODUCTION

The progress at the Copenhagen Conference of the Parties 15 (COP15) to include the reduction of greenhouse gas emissions from deforestation and forest degradation (REDD) in the post-Kyoto UNFCCC agreement manifested the demand for reliable remote sensing data streams to support tropical nation's establishment of measurement, reporting, and verification (MRV) systems to track forest carbon. ALOS/PALSAR has emerged as an invaluable data source to ingest into MRV data streams, largely due to its annual global wall-to-wall strategic data acquisition supporting fine-resolution mapping of deforestation and forest degradation rates, which can feed into biomass estimators directly derived from fusion of remote sensing and field data, and emission estimates when coupled with carbon stock maps or emissions models ([1]-[5]).

This paper reports on progress in the compilation of a consistent pan-tropical ALOS/PALSAR database where 16,000 ALOS dual-polarimetric fine-beam (FBD) PALSAR scenes were orthorectified and radiometrically processed. Focus in the data compilation was to construct a pan-tropical database from the first available dual-polarimetric data acquired since in 2007 to form a baseline data base to compare with subsequent observations.

2. ALOS/PALSAR DATA

The vast majority of the PALSAR FBD data were acquired in 2007 (96.5%) and missing acquisition tracks were filled with 2008 (3.5%) data. Figure 1 shows the month of acquisition of all data in the database. To preserve the possibility of interferometric and coherence analysis, PALSAR data were acquired in single-look-complex (SLC) format processed at the Alaska Satellite Facility.

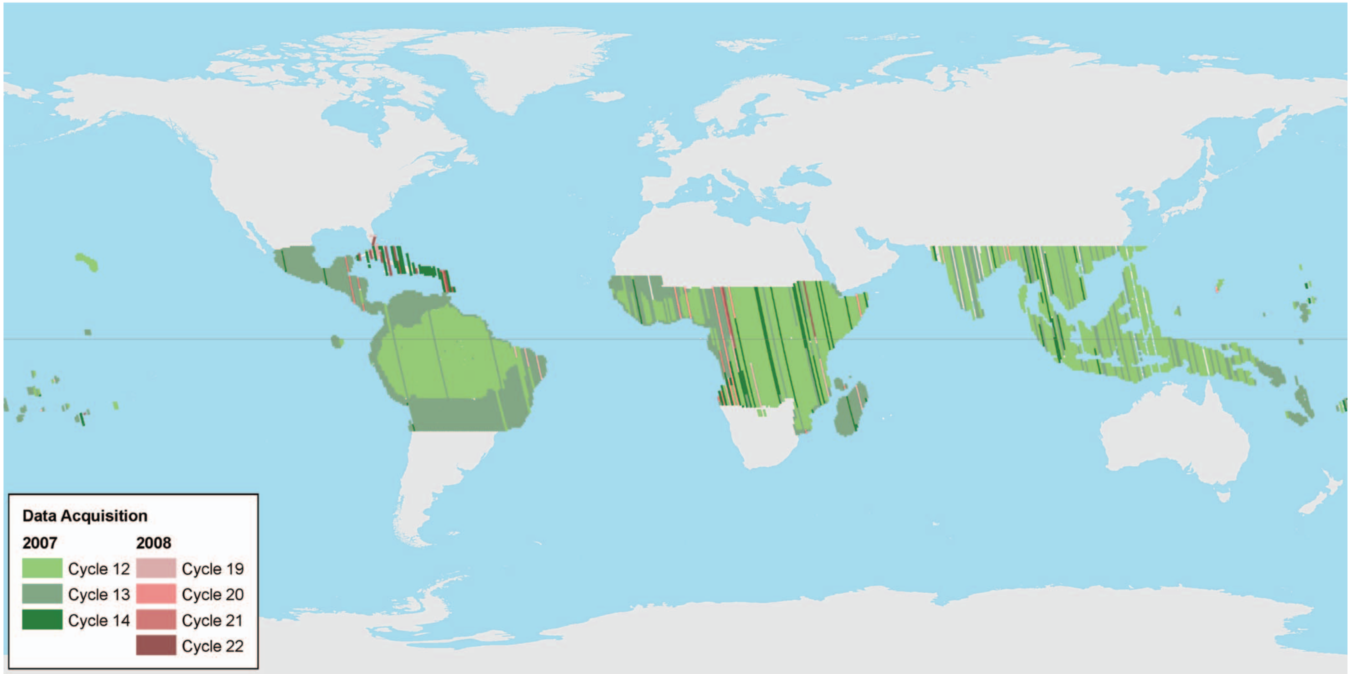

Figure 1: Origin of the PALSAR data from the mapping cycles in 2207 and 2008.

2. DATA PROCESSING

Data processing is performed on a high-performance compute cluster optimized for parallel processing and job scheduling. All incoming SLC data are inventoried, and ingested into a *quicklook processor* to produce an ellipsoid corrected 100 m three band color composite of L-HH, L-LHV, and ratio of LHH/LHV assigned to red, blue, and green colors respectively. Every quicklook frame is subsequently merged into a quicklook-mosaic tile, which covers 10x10 degrees of latitude and longitude. *Full-frame processing* includes the steps of multi-looking to generate a four look, slant-range power image, gamma-map speckle-filtering, remaining antenna pattern correction, geocoding with radiometric correction for local incidence angle, conversion to 16-bit amplitude data and three band 8-bit dB scale image data corresponding to the quicklook color assignment described above. Ancillary data produced for each frame are layover, shadow, and incidence angle masks, and an acquisition date frame to allow the tracking of acquisition date in mosaics. All data are processed unprojected to latitude/longitude coordinate systems based on the WGS84 ellipsoid. The output spatial resolution of the frame processor is set to 0.5 arcseconds, which corresponds closely to 15 m pixel spacing. Mosaicing is performed by overlaying near range over far range data into 5x5 degree latitude longitude tiles. For online visualization three-band data are resampled to 1.5 arcseconds, and flattened to an 8 bit png file format using a color stretch closely resembling a histogram equalized stretch (Figure 2). A kmz file and Google Earth plugin visualization is available at http://whrc.org/pantropical/alos.htm.

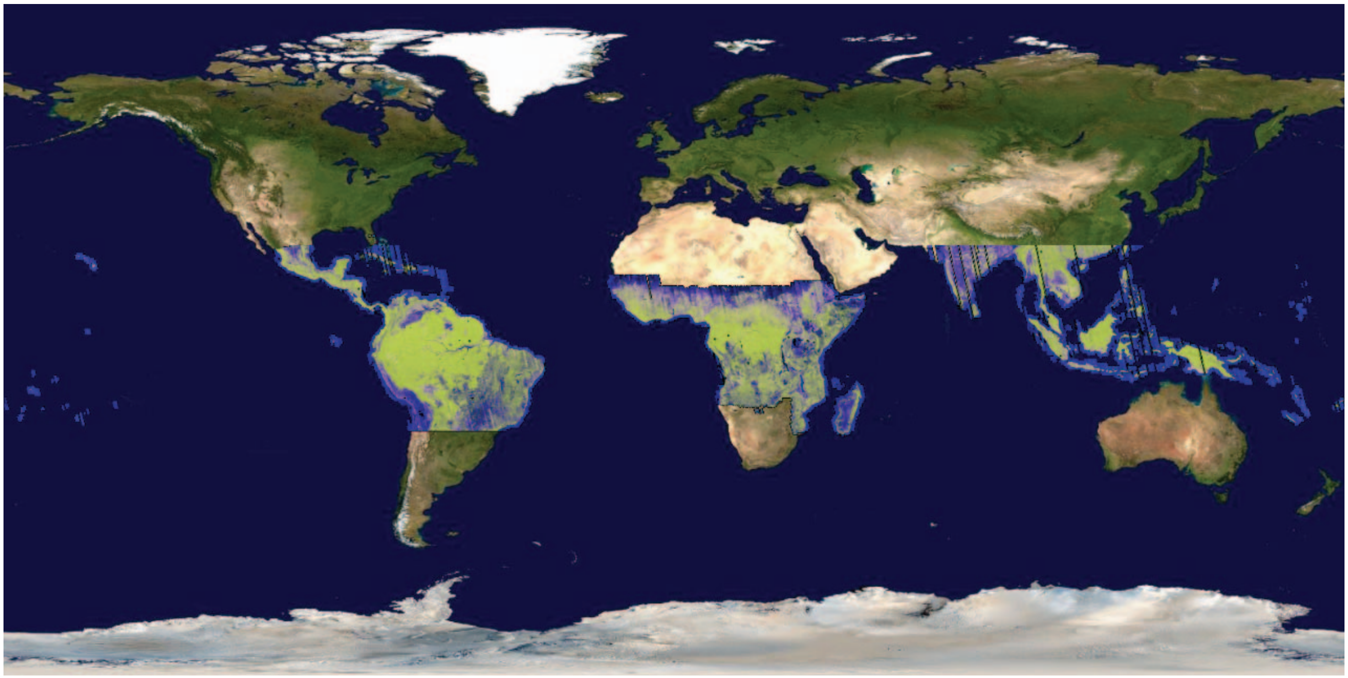

Figure 2: Pan-tropical ALOS PALSAR FBD Data Mosaic on the background of a global MODIS mosaic. The ALOS mosaic is compiled from ca. 16,000 frames.

4. NEXT STEPS

In order to support MRV and other uses, the thematic processing of the pan-tropical data set is now commencing. This includes the generation of a basline forest/non-forest cover map, more detailed regional/national-scale land-cover maps through fusion with optical and anciallary data sets, as well as the construction and analysis of time series data to build the baseline for assesments of deforestation and forest degradation rates.

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